Claims

1.   Flat glass annealing lehr equipped with controlled heating and cooling means comprising, in particular, pre-annealing (A), annealing (B), and post-annealing (C) zones with heat exchange by radiation, the said zones being equipped respectively with groups of cooling-air heat exchangers situated above and/or beneath the glass ribbon, characterized in that it comprises:
- a single cooling-air intake manifold (23) for the groups of exchangers in the pre-annealing (A) and annealing (B) zones, which manifold is situated where the said zones meet, and
- a single cooling-air intake manifold (25) for the groups of exchangers in the annealing (B) and post-annealing (C) zones, which manifold is situated where the said zones meet.

2.   Lehr according to Claim 1, characterized in that the single manifold (25) located where the annealing (B) and post-annealing (C) zones meet is produced in the form of a ducts, divided vertically into two sections to which the groups of exchangers (8) of the annealing zone (B) and those (16) of the post-annealing zone (C) are connected.

3.   Lehr according to one of Claims 1 and 2, characterized in that it comprises a single fan (24) installed in the zone (B) and which draws in the air that flows through the groups of exchangers (5) of the zone (A) and through the groups of exchangers (8) of the zone (B).

4.   Lehr according to any one of the preceding claims, characterized in that it comprises a system for controlling the temperature of the cooling air on intake to zone (B) and on discharge from zone (C).

5.   Lehr according to Claim 4, characterized in that the said temperature-control system comprises:

- one or more temperature sensors (TCA) situated at the end of the pre-annealing zone (A),

- a temperature regulator (RA1) to which the temperature sensors (TCA) are connected and which has, at its reference point, the desired temperature for the end of zone (A),

- a number of motorized valves (22) actuated by the said regulator and which regulate the air flow rate passing through each group of exchangers (8) of zone (A),

- one or more temperature sensors (TCB1) situated at the end of the annealing zone (B),

- a temperature regulator (RB1) to which the said temperature sensors (TCB1) are connected and which has, as its reference point, the desired temperature for the end of zone (B),

- a number of motorized valves (12) actuated by the said regulator (RB1) and which regulate the flow rate of air recirculated through each group of exchangers (8) of the said zone (B);

- a system for controlling the temperature of the recirculating air passing through the exchangers (8) of the said annealing zone (B) and which comprises one or more temperature sensors (TCB2) installed in the inlet ducts of the said exchangers, a temperature regulator (RB2) receiving its temperature reference point from a temperature sensor (TCC1) installed in the intake duct of the said exchangers (8) and regulating the air temperature on inlet into the said exchangers via regulating valves (10, 11);

- one or more temperature sensors (TCC2) at the end of the post-annealing zone (C);

- a temperature regulator (RC1) to which the said temperature sensors (TCC2) are connected and which has as its reference point the desired temperature

for the end of zone (C), and

- a number of motorized valves (26) regulating the air flow rate recirculated through the exchangers (16) of the said zone (C).

6. Lehr according to Claim 5, characterized in that the said temperature control system, on the basis of temperature measurements taken by all of the said temperature sensors of each of the said zones (A, B and C), adapts the temperatures and the flow rates of air in the exchangers of the said zones in such a way as to obtain a glass ribbon temperature curve similar to the theoretical annealing curve.

7. Lehr according to one of Claims 5 and 6, characterized in that the said regulators are built into a centralized regulating system employing algorithms of the fuzzy logic type.

8. Lehr according to one of Claims 5 and 6, characterized in that the said regulators are built into a centralized regulating system employing neuro-predictive algorithms.

Claims

1. Flat glass annealing lehr equipped with controlled heating and cooling means comprising, in particular, pre-annealing, annealing, and post-annealing zones with heat exchange by radiation, the said zones being equipped respectively with groups of cooling-air heat exchangers situated above and/or beneath the glass ribbon, said lehr further comprising:
   - a single cooling-air intake manifold for the groups of exchangers in the pre-annealing and annealing zones, which manifold is situated where the said zones meet, and
   - a single cooling-air intake manifold for the groups of exchangers in the annealing and post-annealing zones, which manifold is situated where the said zones meet.

2. Lehr according to Claim 1, wherein the single manifold located where the annealing and post-annealing zones meet is produced in the form of a ducts, divided vertically into two sections to which the groups of exchangers of the annealing zone and those of the post-annealing zone are connected.

3. Lehr according to Claim 1 further comprising a single fan installed in the annealing zone and which draws in the air that flows through the groups of exchangers of the pre-annealing zone and through the groups of exchangers of the annealing zone.

4. Lehr according to Claim 1, comprising a system for controlling the temperature of the cooling air on intake to annealing zone and on discharge from post-annealing zone.

5.   Lehr according to Claim 4, wherein said temperature-control system comprises:

- one or more temperature sensors situated at the end of the pre-annealing zone,

- a temperature regulator to which the temperature sensors are connected and which has, at its reference point, the desired temperature for the end of pre-annealing zone,

- a number of motorized valves actuated by the said regulator and which regulate the air flow rate passing through each group of exchangers of pre-annealing zone,

- one or more temperature sensors situated at the end of the annealing zone,

- a temperature regulator to which the said temperature sensors are connected and which has, as its reference point, the desired temperature for the end of annealing zone,

- a number of motorized valves actuated by the said regulator and which regulate the flow rate of air recirculated through each group of exchangers of the said annealing zone ;

- a system for controlling the temperature of the recirculating air passing through the exchangers of the said annealing zone and which comprises one or more temperature sensors installed in the inlet ducts of the said exchangers, a temperature regulator receiving its temperature reference point from a temperature sensor installed in the intake duct of the said exchangers and regulating the air temperature on inlet into the said exchangers via regulating valves ;

- one or more temperature sensors at the end of the post-annealing zone ;

- a temperature regulator to which the said temperature sensors are connected and which has as its reference point the desired temperature for the end of post-annealing zone, and

- a number of motorized valves regulating the air

flow rate recirculated through the exchangers of the said post-annealing zone.

6. Lehr according to Claim 5, said temperature control system, on the basis of temperature measurements taken by all of the said temperature sensors of each of the pre-annealing, annealing and post-annealing zones, adapts the temperatures and the flow rates of air in the exchangers of the said zones in such a way as to obtain a glass ribbon temperature curve similar to the theoretical annealing curve.

7. Lehr according to Claims 5 and 6, wherein the said regulators are built into a centralized regulating system employing algorithms of the fuzzy logic type.

8. Lehr according to Claims 5 and 6, wherein said regulators are built into a centralized regulating system employing neuro-predictive algorithms.